Bay Area Air Quality Management District

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Staff Report

Proposed Amendments to BAAQMD Regulation 8, Rule 44: Marine Vessel Loading Operations

Proposed Deletion of BAAQMD Regulation 8, Rule 46: Marine Tank Vessel to Marine Tank Vessel Loading

Proposed Amendments to Manual of Procedures, Volume IV: Source Test Policy and Procedures, ST-34: Bulk And Marine Loading Terminals – Vapor Recovery Units

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I. Executive Summary

Air District staff is proposing amendments to the rules that control air pollution from marine tank vessel (oil tanker) activities. The rules were adopted in 1989 to regulate activities that release vapors from organic liquid cargoes carried by tankers. Regulation 8, Rule 44 applies to loading of organic liquids at marine terminals, such as those operated by Bay Area refineries. Rule 46 applies to lightering – the transfer of cargoes, usually crude oil, from large tankers to smaller tankers that can more easily navigate the relatively shallow San Francisco Bay. Most lightering is carried out at Anchorage 9, just south of the Bay Bridge. The current rules apply to five types of organic liquid cargoes: gasoline, gasoline blending stocks, aviation gasoline, JP-4 jet fuel, and crude oil.

The proposed amendments would (1) continue to require controls for the five liquid categories listed in the current rules (gasoline, gasoline blending stock, aviation gas, JP-4 jet fuel, and crude oil) and add requirements to control other liquids with a flash point below 100 ˚F, (2) clarify application of more stringent leak standards for the equipment that controls emissions, (3) clarify and extend requirements for various activities – ballasting, tank washing, purging, and gas freeing - that can vent tank emissions to the atmosphere, (4) consolidate requirements found in two separate rules into one rule, and (5) make minor amendments in the source test procedure used to test vapor recovery units at marine terminals.

The proposed amendments would extend control requirements to a group of volatile organic chemicals that are not listed in the current rule and are handled in relatively small quantities in the Bay Area. These cargoes have flash points below 100 ˚F (flash point is the lowest temperature at which a liquid will generate sufficient vapor to form a flammable air-vapor mixture near its surface) and are as volatile as the cargoes currently controlled. As a result, these cargoes produce relatively high emissions during loading or transfer. Emission reductions from controlling these cargoes would be cost effective because significant emission reductions can be achieved by controlling a relatively small volume of cargoes.

The proposed amendments would clarify the leak requirements that apply to marine tank vessel activities. Most of the terminals subject to the rule already comply with more stringent leak standards in Regulation 8, Rule 18 (“Equipment Leaks”) that were adopted in 1998.

The proposed amendments would also require controls for various activities that may release organic vapors contained in cargo tanks. These activities, collectively called "venting" in the proposed amendments, include purging and gas freeing. Virtually all tankers in petroleum service that call on the Bay Area have inert gas systems that they use to prevent the formation of an explosive atmosphere inside cargo tanks. In purging, inert gas is introduced into a tank to reduce the hydrocarbon level, often in preparation for gas freeing. Gas freeing involves flushing the tank with air, generally to make it safe for tank entry, usually for repairs or final cleaning. The proposed amendments would require that these activities be conducted outside Bay Area waters or, if within Bay Area waters, using emission controls.

The proposed amendments would eliminate Regulation 8, Rule 46, which is nearly identical in structure and content to Rule 44, and would incorporate Rule 46’s lightering requirements into

Rule 44. The deletion of Rule 46 is intended to consolidate all requirements affecting marine tank vessel activities into a single rule.

The proposed amendments are the result of an extensive rule development process that began with Further Study Measure FS-11 ("Marine Tank Vessel Operations") from the Bay Area 2001 Ozone Attainment Plan. The primary question addressed by the further study was whether controls on low-volatility cargoes like distillate oils (such as diesel #2) and residual oils (such as fuel oil #6) would produce significant emission reductions. The evidence developed during the study does not suggest that significant emission reductions would result from controls on these cargoes. In addition, controls on distillate and residual oils would not significantly reduce worker exposure to hazardous air pollutants (HAPs), a beneficial side effect of controls on high volatility cargoes like gasoline. Distillate and residual oils contain relatively low levels of HAPs and evaporate slowly so that, for example, between 15 and 40 uncontrolled loadings of distillate oils into barges would produce roughly the same HAP emissions as one controlled loading of gasoline into a barge. In addition, other agencies – the U.S. Occupational and Health Administration and Cal/OSHA – have promulgated regulations that limit workplace exposure to benzene and other HAPs. Other elements of Further Study Measure FS-11 are discussed in Section II.B.

The rule development process for the proposed amendments included 6 workgroup meetings between 2002 and 2004 and rule development workshops in 2002, 2003, and 2005. A socioeconomic analysis of the proposed amendments concludes that the amendments would not have significant economic effects. Pursuant to the California Environmental Quality Act, an initial study was prepared for the proposal. The initial study concludes that the rule amendments would not cause significant environmental impacts, and a CEQA negative declaration is proposed for adoption.

II. Background

A. Tanker and Terminal Operations

Bay Area refinery inputs and outputs are primarily transported by pipelines and marine vessels. The Bay Area petroleum industry is one of the oldest industries in the Bay Area, dating back to the late 1800's. Four of the five Bay Area refineries were built before 1920. Much of the transportation infrastructure that serves the refineries also dates back to this time Ships began moving oil along the California coast in the 1880's, and the first true oil tanker began sailing for a Chevron predecessor in 1896. In addition, the major crude oil pipelines that serve the Bay Area refineries were all built before 1920.

In 2004, approximately 42% of the crude oil that supplied California refineries came from within California, while 22% came from Alaska and 36% came from foreign sources. The Bay Area refineries are served by crude oil pipelines that transport crude oil from the southern San Joaquin valley. Most other crude comes by tanker. Very little crude oil is loaded in the Bay Area for delivery elsewhere. Some of the inbound crude is lightered onto smaller vessels that can more easily navigate through the relatively shallow San Francisco Bay. As a result, the Air District's loading rule (Rule 44) has a very limited impact on the crude trade, while the lightering rule

(Rule 46) has a greater impact.

The Bay Area is a net exporter of petroleum products. Much of the Bay Area's gasoline and jet fuel production is transported by product pipelines that include a north-south line from Chico to Bakersfield and a west-east line from Brisbane to Reno. All of the Bay Area refineries are connected to the pipelines. Through the pipelines, the refineries are also directly connected to the Oakland, San Francisco, and San Jose airports as well as to Travis AFB, Mather Airport, McClelland AFB, Lemoore Naval Air Station (near Fresno), and Fallon Naval Air Station (near Reno). In addition, large quantities of petroleum products are transported by tankers and barges. Because petroleum products are rarely lightered, the Air District's loading rule (Rule 44) has the primary impact on the product trade.

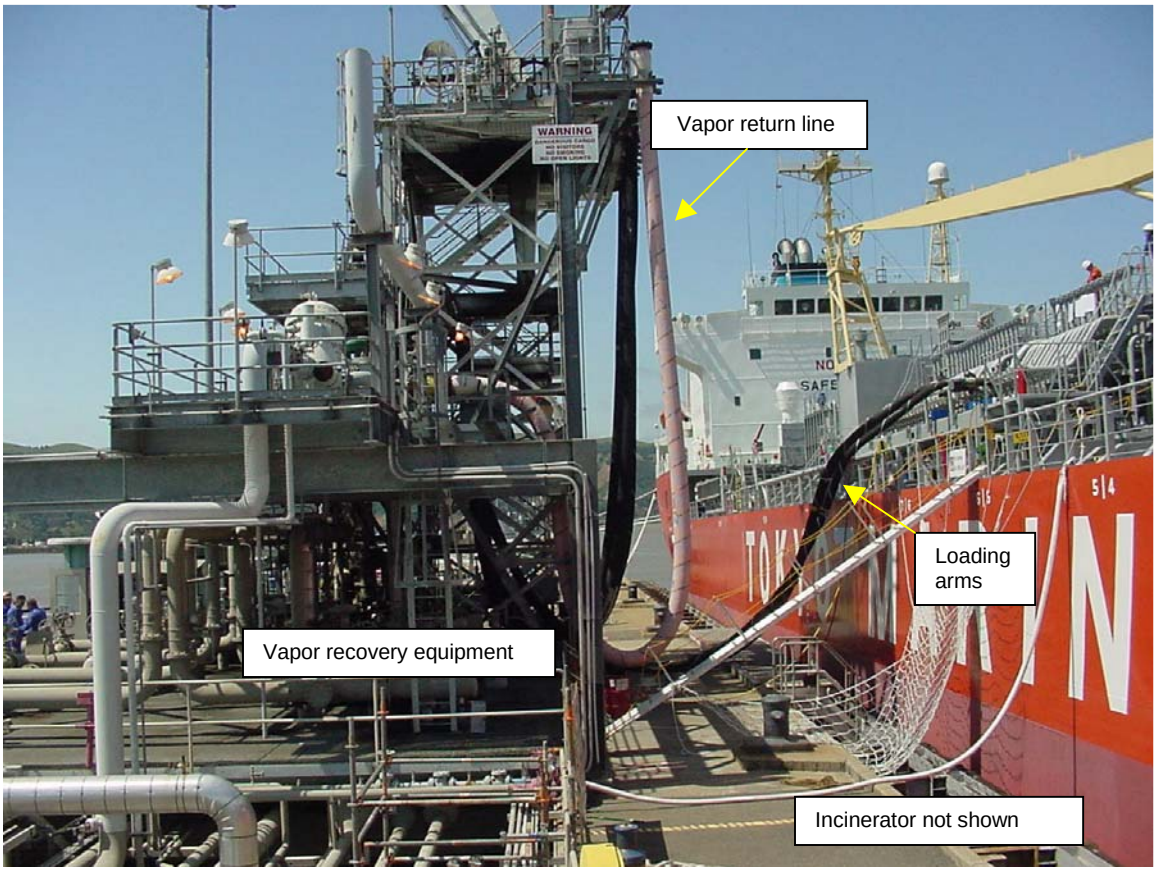
In response to the Air District's loading rule, Bay Area marine terminals installed equipment to capture and control vapors. Table 1 lists Bay Area facilities that operate vapor recovery systems for loading marine vessels.

TABLE 1: BAY AREA MARINE LOADING TERMINALS

Facility	Air District Plant #	Location
BP West Coast Products, LLC	13637	Richmond
Chevron Refinery	10	Richmond
ConocoPhillips Refinery	16	Rodeo
ConocoPhillips Terminal	15693	Richmond
IMTT Terminal	10649	Richmond
Pacific Atlantic Terminals LLC (formerly Shore Terminals - Richmond)	17370	Richmond
Pacific Atlantic Terminals LLC (formerly Shore Terminals - Martinez)	7034	Martinez
Shell Refinery	11	Martinez
ST Shore Terminals LLC	581	Crockett
Tesoro Refinery	14628	Martinez
Tesoro Terminal (Amorco)	14629	Martinez
Valero Refining	12626	Benicia

The vapor recovery systems used at terminals capture vapors forced out of tanks being loaded and send them through a vapor return line to an incinerator or carbon adsorption system. These systems are similar in concept to the vacuum assist systems found at many gas stations.

The photograph below shows a vessel loading an unregulated cargo. Because this loading operation does not require control, the vapor recovery hose is not connected to the vapor return line on the ship. The vapor recovery equipment is located to the left of the vessel.



The incinerator for the loading operation illustrated on the previous page is shown in the photograph below.

In lightering, the vapors forced out of the tanks on the smaller vessel to which cargoes are transferred are returned to the larger vessel through a vapor return line. These vapor balance systems are similar in concept to vapor balance systems found at gas stations.

B. Emissions

Regulation 8, Rule 44 is one of many Air District regulations that is intended to reduce emissions of organic compounds so that the Air District can attain and maintain compliance with state and federal ozone standards.

Pollutant emissions are typically estimated by multiplying emission factors, which specify expected emissions for some measure of activity, by the amount of the activity occurring over the period in question. For marine loading, organic emission factors are generally stated in terms of pounds of emissions for each thousand gallons or thousand barrels loaded (a barrel is 42 gallons). Activity is typically expressed in terms of thousands of barrels loaded in a single loading event or over a month or a year.

1. Emission Factors

Loading and Lightering

Organic compound emissions are generated when marine tank vessels are loaded with organic liquids. In general, liquid is loaded into the marine vessel tank, where the liquid achieves equilibrium over time with its vapor. During loading, vapors from the loaded liquid, along with the air and other gasses that were in the tank prior to the loading, are displaced from the tank by the rising liquid. The total mass of emissions vented from the tank depends on the volume of vapors displaced, the concentration of organic compounds in these vapors, the molecular weight of the organic vapors, and the volume of organic vapors vented during the loading event.

Loading emissions can be measured directly or they can be estimated from emission factors that are derived from such measurements. Developing emission factors for the loading of organic liquids into marine tank vessels is complicated by the number of variables that affect emissions. In its AP-42 Compilation of Emission Factors document, U.S. EPA identified the five primary factors: (1) physical and chemical characteristics of the previous cargo, (2) method of unloading the previous cargo, (3) operations to transport the empty carrier to a loading terminal, (4) method of loading the new cargo, and (5) physical and chemical characteristic of the new cargo. These factors can be divided into those that relate to the prior cargo and those that relate to the new cargo.

In developing its emission factors for organic liquids other than crude oil and gasoline, U.S. EPA relied upon a limited data set and a correlation equation based on that data set. The correlation equation can be used for a variety of organic liquids if certain properties of those liquids are known. According to AP-42, the correlation equation, which is shown below, can be used to estimate emissions (within ±30%) for cargoes other than gasoline and crude oil.

$$L_L = 12.46\frac{SPM}{T}$$

where:

L_L = the loading loss, pounds per 1000 gallons ($lb/10^3$ gal) of liquid loaded
S = a saturation factor from a table
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole)
T = temperature of bulk liquid loaded, °R (°F + 460)

The most important factor in this equation is the true vapor pressure of the liquid loaded. The saturation factor (0.2 for ships, 0.5 for barges) remains constant. Temperature is of minor significance as a factor in the equation over the range of temperatures typically encountered (from ambient temperature up to about 175 °F) because the temperature used in the equation is in degrees Rankin (degrees Fahrenheit plus 460 degrees) so that this factor only varies by about 20%. However, because temperature affects the most important factor, true vapor pressure, temperature can have a significant effect on emissions.

The AP-42 emission factors for gasoline and crude oil rely on correlation equations developed specifically for those cargoes. These emission factors are based on different and larger data sets than the set used for the general equation above. AP-42 includes calculated emission factors for some of the cargoes covered by the current rule as well as for several others. The factors for gasoline and crude oil are based on data and equations developed specifically for those cargoes, while the factors for other cargoes are based on the general equation above. These factors are shown in Table 2. This table also shows the strong correlation between vapor pressure (and volatility) and emission factor.

TABLE 2: U.S. EPA'S AP-42 LOADING EMISSION FACTORS

Cargo	**AP-42 Emission Factor (lb/1,000 bbl)***	**True Vapor Pressure @ 60°F (psi)**
gasoline	76 (ships) 143 (barges)	3.5
crude oil	26 (ships) 42 (barges)	2.8
JP-4 (jet fuel)	21 (ships) 50 (barges)	1.3
Jet A	0.2 (ships) 0.5 (barges)	0.0085
distillate oil (#2 or diesel)	0.2 (ships) 0.5 (barges)	0.0074
residual oil (#6)	0.002 (ships) 0.004 (barges)	0.00004

In implementing Further Study Measure FS-11 ("Marine Tank Vessel Activities") from the Bay Area 2001 Ozone Attainment Plan, the Air District conducted 5 source tests on loading activities involving distillate and residual oils. These tests are time consuming and expensive. The tests covered the entire loading event because emissions typically change as the liquid level within a tank rises. Some loading operations take up to several days to complete because of the large volumes of liquid loaded. Table 3 shows the results of the Air District tests, and the results of independent CARB analyses.

TABLE 3: SOURCE TEST RESULTS, 2002 FURTHER STUDY

Cargo	Emission Factor, (lb/1000 bbl)	Prior Cargo	Load Temp.	Flash Point
flash distillate oil	District: 2.1	NA	153 °F	NA
diesel oil	District: 2.0 CARB: 2.0	diesel	82 °F	125 to 180 °F
fuel oil #6	District: 1.4 CARB: 1.6	fuel oil #6	171 °F	>150 °F
high sulfur fuel oil	District: 4.7	fuel oil	125 °F	202 °F
JP-8 jet fuel	District: 1.1 to 2.2	JP-8 jet fuel	63 °F	150 °F

The Air District source test results clustered around the emission limit in the current rule of 2 pounds per thousand barrels with an exception for the high sulfur fuel oil test. An interesting aspect of the results is the variance between the test results and the theoretically derived AP-42 emission factors. The distillate products (flash distillate oil, diesel, and JP-8) all have test emission rates approximately 10 times higher than their AP-42 emission factors. One of the residual products also has a test emission rate close to 2 lb/1000 bbl, which is approximately 1000 times higher than what would be expected based on AP-42. The other residual loading exceeds the AP-42 emission factor by an even larger margin.

There are several possible explanations for the difference between AP-42 factors and the test results for distillate and residual oils. The AP-42 factors for these cargoes were derived from limited data sets which may be inaccurate for low-vapor-pressure liquids. While the Air District source tests were direct field measurements, the tests did not control for all of the variables that may affect emissions. Although the Air District attempted to determine prior cargoes, it was only able to obtain general information about the prior commodities for 4 of the 5 tests. Thus it is possible that significant contributions to the measured emissions are related to prior cargoes, either immediately prior cargoes or earlier cargoes. The Air District also did not have resources available to analyze the vessel piping – which is often quite complex – to ensure that there was no carryover of vapors from tanks other than the one being loaded. It is therefore possible that emissions contributions came from other tanks that may have been loaded prior to testing. Another variable not addressed was the ship's inert gas generator, which was not separately tested and may have contributed to measured emissions.

Another noteworthy aspect of the test results is that emissions were relatively uniform during the tests. This observation differs from what is typically observed in the loading of gasoline and other volatile commodities: emissions are relatively low at the beginning of a test and increase as the liquid level rises and begins to push stratified organic vapors, which have the highest concentration of high molecular weight compounds near the liquid's surface, out of tank vents. The observation is consistent, however, with the observation that diesel and residual oils have very low volatility and would not be expected to produce a mass of organic vapors sufficient to significantly affect loading emissions. The observation is also consistent with the idea that the emissions measured in the Air District source tests may have a significant contribution from

something other than the liquid being loaded and may well represent “baseline” emissions related to inert gas generator exhaust and carryover from prior cargoes or other tanks.

As a result of the source tests and the foregoing analysis, the Air District has concluded that loading typically involves baseline emissions of approximately 2 pounds per thousand barrels, which result from a variety of potential sources. There is little evidence to suggest that emissions from loading of cargoes with low vapor pressures like those typical of distillate and residual oils results in emissions significantly higher than this baseline. There may be cases where a cargo, particularly a residual oil, will have an unusually high vapor pressure or a low flash point because light ends have been added to the oil. However, the proposed requirements to control cargoes with low flash points should result in controls in these cases.

The 4.7 lb/1000 bbl result for high sulfur fuel oil is not inconsistent with the Air District's conclusion that 2 lb/1000 bbl are the reasonably expected emissions from distillate and residual oil cargo loading. First, if this cargo had significant volatility and contributed significantly to emissions, the typical increase in emissions toward the end of the loading cycle would have been observed. As with the other tests, no such increase was observed and cargo volatility does not seem to have been a factor. Second, this high result was balanced against other test results below 2 lb/1000 bbl in reaching the conclusion that 2 lb/1000 bbl is a reasonable emission factor for these cargoes. Third, the result is within the normal variation observed with prior tests of tanker loading. In 1992, after Bay Area terminals installed emission controls in response to Regulation 8, Rule 44, the Air District conducted source tests during loading of gasoline and crude oil into ships. These source test results are summarized in Table 4.

TABLE 4: AIR DISTRICT SOURCE TEST RESULTS, 1992

Cargo	Emission Factor, Before Controls (lb/1000 bbl)	Emission Factor, After Controls (lb/1000 bbl)
MTBE	35.4	0.098
gasoline	106.1	2.33
gasoline	32.3	<0.83
gasoline	31.2	<0.035
gasoline	47.2	0.02
SJV crude	7.6	0.2
gasoline	109.2	<0.14
gasoline	16.6	<0.22
Pt. Arguello crude	18.6	NA
SJV Crude	19.6	NA

Both gasoline and crude oil loading show significant variation in test results. Gasoline emission factors ranged from 16.6 lb/1000 bbl to 109.2 lb/1000 bbl, with an average factor of 57 lb/1000

bbl. Crude oil emission factors ranged from 7.6 lb/1000 bbl to 19.6 lb/1000 bbl with an average factor of 15 lb/1000 bbl. Of note is that these average emission factors are relatively close to the AP-42 emission factors for gasoline and crude oil, which might be expected because of the larger data sets used to develop those emission factors.

Ballasting

Ballasting is the introduction of seawater into vessel tanks in order to obtain proper hull, propeller, and rudder immersion, generally after a vessel has discharged its cargo and is riding high in the water. Although modern vessels are typically designed with “segregated” ballast tanks that are not used for cargo storage, older vessels may not have segregated ballast tanks, and even vessels with segregated tanks may use empty cargo tanks for ballast in especially rough ocean conditions.

U.S. EPA’s AP-42 emission factors include factors for ballasting. The AP-42 emission factor for "typical overall" ballasting situations is 46 lb/1000 bbl. The Air District has not conducted any source tests for ballasting emissions.

Venting

Virtually all tankers that call on the Bay Area have inert gas systems that are used to keep tank atmospheres outside the explosive range through the introduction of "inert gas," typically scrubbed vessel exhaust, into cargo tanks. Inert gas systems are employed to maintain an inert gas blanket over an organic liquid cargo, to fill tanks with inert gas to replace discharged cargo, to purge hydrocarbon vapors from an empty tank, and to purge air from a clean tank prior to the introduction of cargo. Though AP-42 does not include an emission factor specifically for venting, emissions in the most common case - when tanks are purged after crude oil discharge - would be best represented by the emission factor for ballasting. As with ballasting, the Air District has not conducted source tests of venting emissions.

2. Vessel Activity

To calculate emissions and emission reductions, information on emission factors must be combined with vessel activity data. In developing emission and emission reduction estimates, the Air District has relied on vessel activity data from two sources: (1) U.S. Army Corps of Engineers data contained in its annual publication titled "Waterborne Commerce of the United States," and (2) an extensive survey and compilation of data from Further Study FS-11. The Corps of Engineers data is the more recent data but the Air District survey data is the more comprehensive data.

Army Corps of Engineers Data

Primarily because of the high demand for motor, aviation and other fuels in the Bay Area, San Francisco Bay and its ports handle large quantities of crude oil, refined and intermediate petroleum products, and other organic liquids. Crude oil is imported into San Francisco Bay in large tanker vessels, and then lightered into smaller vessels for distribution to area refineries. Refined petroleum products and organic chemicals are produced at area refineries and chemical

plants and loaded onto marine vessels for distribution along the Pacific Coast or elsewhere. Table 5 summarizes data from the U.S. Army Corps of Engineers[2] for commodity traffic through the entrance to San Francisco Bay in 2003 and indicates which cargos are currently subject to Rule 44.

TABLE 5: 2003 COMMODITY TRAFFIC

Cargo (note 1)	2003 Volume (1,000 bbl)	Emissions Controlled by Current Rule 44?
crude oil	161,000	yes
Gasoline	38,000	yes
kerosene	180	no
distillate fuel oils and diesel fuel	17,000	no
residual fuel oils	11,600	no
fuel intermediates (naphtha, others)	2,200	yes (note 2)
heavy refined products (lube oil, grease, wax, asphalt)	7,600	no
organic chemicals (benzene, toluene, alcohols, others)	8,500	no (note 2)

1. In addition to the traffic shown in this table, area refineries also receive crude oil by pipeline from California oilfields, and distribute gasoline, jet fuel and other products via pipeline, tanker truck and rail.
2. Only fuel intermediates used in gasoline production are regulated by Rule 44; intermediates used in diesel production are not currently regulated. Miscellaneous organic chemicals, including benzene and toluene, may be used as fuel blending stocks and are regulated by Rule 44 if used in gasoline production.

As shown in Table 5, there is significant traffic in a category the Army Corps of Engineers calls "organic chemicals." This cargo consists of volatile organic chemicals such as benzene and toluene with high unabated loading emission factors similar to those for currently-regulated materials. These cargoes are not currently regulated by Regulation 8, Rule 44 unless they are used as gasoline blending stocks.

Air District Survey Data

In conducting Further Study FS-11, the Air District examined Army Corps of Engineers data. However, there are some difficulties in using the Corps data for calculating emissions because it is difficult to determine quantities of cargoes actually loaded at Bay Area terminals and distinguish them from those cargoes that passed through the Golden Gate for unloading in the Bay Area or those cargoes that were loaded outside the Bay Area but nevertheless passed through the Golden Gate.

As a result of the difficulties with the Corps data, the Air District conducted an extensive data gathering effort to determine more precisely the volume of cargoes loaded. To do this, the Air District collected available records from all terminals and submitted data requests to supplement this data. The Air District assembled records for all Bay Area loading of organic liquids that occurred during the period from September 2000 through August 2001. The various

commodities loaded were classified as "light," "medium," or "heavy" cargoes. The cargo classification is shown in Table 6.

TABLE 6: CARGO CLASSIFICATION – FS-11

Light Cargoes	Medium Cargoes	Heavy Cargoes
Gasoline	Jet fuel	Fuel oil
Crude oil	Diesel oil	Bunker oil
Aviation gas & aviation fuel (JP-4)	Cutter stock	Lube oil
Gasoline blending stock	Alkane	Charge stock
Naphtha	Kerosene	Cat Cracker Feed
Ortho-Benzene	Diesel blending stock	Gas oil
	Light Cycle Oil	Black oil
		Residual oil
		Polymers

Currently-regulated cargoes were classified as light cargoes. Almost all of the light cargoes were gasoline. Almost all of the medium cargoes were diesel oils. The heavy cargoes were a variety of residual oils, including fuel oil #6, bunker oil, gas oil, lube oil, and carbon black.

The quantities loaded for each cargo classification are shown in Table 7.

TABLE 7: CARGO QUANTITIES LOADED 9/00 TO 8/01

Facility Type	Quantities Loaded (barrels)		
	Light Cargoes	Medium Cargoes	Heavy Cargoes
Refinery Terminals	17,428,154	6,766,530	31,413,080
Other Terminals	6,963,825	19,045,922	19,761,093
Totals	**24,391,979**	**25,812,452**	**51,174,173**

3. Emissions Estimates

The Air District has estimated emissions from commodity categories based on both the 2003 Army Corps of Engineers activity data and the District's 2001 survey data.

2003 Emissions – Army Corps of Engineers Data

Total estimated emissions for the organic chemical category for which controls **are** proposed and for distillate and residual oils for which controls **are not** proposed were calculated as follows:

For organic chemical cargoes:

Assuming a very conservative (low) average factor of 10 lb/1,000 bbl, the emissions subject to control would be:

(8,500,000 bbl/yr) (10 lb/1,000 bbl) (ton/2,000 lb) = 42.5 ton/yr or 0.12 ton/day

For distillate oil cargoes:

Assuming an average factor of 2 lb/1,000 bbl for distillate oils, the uncontrolled emissions from these cargoes would be:

(17,000,000 bbl/yr) (2 lb/1,000 bbl) (ton/2,000 lb) = 17.0 ton/yr or 0.05 ton/day

For residual oil cargoes:

Assuming an average factor of 2 lb/1,000 bbl for residual oils, the uncontrolled emissions from these cargoes would be:

(11,600,000 bbl/yr) (2 lb/1,000 bbl) (ton/2,000 lb) = 11.6 ton/yr or 0.03 ton/day

2001 Emissions – Air District Survey Data

Total estimated uncontrolled emissions for the three cargo categories were calculated as follows:

For light cargoes:

Assuming an average factor of 50 lb/1,000 bbl for light cargoes, most of which is gasoline, the uncontrolled emissions from these cargoes would be:

(24,391,979 bbl/yr) (50 lb/1,000 bbl) (ton/2,000 lb) = 610 ton/yr or 1.67 ton/day

For medium cargoes (distillate oils):

Assuming an average factor of 2 lb/1,000 bbl for distillate oils, the uncontrolled emissions from these cargoes would be:

(25,812,452 bbl/yr) (2 lb/1,000 bbl) (ton/2,000 lb) = 25.8 ton/yr or 0.07 ton/day

For heavy cargoes (residual oils):

Assuming an average factor of 2 lb/1,000 bbl for residual oils, the uncontrolled emissions from these cargoes would be:

(51,174,173 bbl/yr) (2 lb/1,000 bbl) (ton/2,000 lb) = 51.2 ton/yr or 0.14 ton/day

B. Rule History

Regulation 8, Rule 44 and Rule 46 were both adopted in 1989. The rules were the first of their kind in the nation. The rules require the control of emissions from loading or lightering of five materials (gasoline, gasoline blending stocks, aviation gasoline, JP-4 aviation fuel, and crude oil). Emissions must not exceed 2 pounds per thousand barrels (2 lb/1,000 bbl) of material loaded or they must be reduced by at least 95% by weight. These five materials were chosen because they were considered to be the only materials with significant emissions and significant loading volume in the Bay Area.

The Bay Area 2001 Ozone Attainment Plan included Further Study Measure FS-11 ("Marine Tank Vessel Activities"). The results of this study measure were published in December 2002 in a draft technical assessment document (TAD). In the further study, Air District staff attempted to determine whether significant emission reductions could be cost-effectively achieved by: (1) regulating currently unregulated liquids, (2) imposing more stringent control requirements, (3) tightening leak standards, and (4) regulating activities that vent tank vapors to the atmosphere.

1. Unregulated Liquids

The primary question addressed by the TAD was whether controls on low-vapor-pressure cargoes like distillate oils and residual oils would produce significant emission reductions. In order to determine whether emissions from loading of medium and heavy cargoes are significant, the Air District conducted 5 marine loading source tests and summarized the results in the TAD. The TAD also included a summary of test data from other agencies. Though some tests of distillate or residual oil loading indicated an uncontrolled emission factor greater than 2 lb/1000 bbl under circumstances that would not require control under the existing provisions of Rules 44 and 46, others showed the uncontrolled emission factor to be less than 2 lb/1000 bbl. This testing also revealed that a number of factors, besides the properties of the liquid being loaded, may have a large effect on the overall emission rate during loading. The results of Air District testing and results obtained by other agencies suggest that an emission factor of 2 lb/1000 bbl, rather than U.S. EPA's AP-42 emission factors, would provide more reasonable estimates for emissions from loading distillate and residual oils.

2. More Stringent Control Requirements

In the draft TAD, the Air District compared Regulation 8, Rule 44 to rules from other air districts and found that the current Air District abatement standard (2 lb/thousand bbl or 95% by weight) is at least as stringent as corresponding standards in the South Coast AQMD, San Luis Obispo County APCD, and Santa Barbara County APCD. The document did not include a recommendation for a more stringent control standard.

3. More Stringent Leak Standard

In the draft TAD, the Air District found that the current "gas tight" standard for tanks and connectors in Regulation 8, Rules 44 and 46 (10,000 ppm) is less stringent than the standard in the South Coast AQMD and San Luis Obispo County APCD (both 1,000 ppm). However, the draft TAD did not discuss the Air District's more stringent 100 ppm standard, found in Regulation 8, Rule 18, which applies at all of the marine terminals regulated by Regulation 8, Rule 44.

4. Purging and Gas Freeing

In the draft TAD, the Air District found that the South Coast AQMD and San Luis Obispo County APCD require control of gas venting operations where air or inert gas is introduced into a marine tank previously loaded with regulated cargo, usually for safety reasons. Neither the South Coast rule nor the San Luis Obispo rule includes a mechanism to enforce these requirements. The Air District rules do not directly regulate gas venting operations, but have been interpreted by the Air District to apply to some of these activities when they are related to loading or lightering.

III. Proposed Rule Amendments

The proposed rule amendments make changes in eight main areas:

- They broaden applicability of the rule to include currently unregulated liquids with a flash point below 100 ˚F;
- They impose new requirements regarding the control of emissions from ballasting;
- They impose new requirements regarding control of emissions from venting;
- They impose more stringent leak standards;
- They impose new notification requirements;
- They clarify record keeping requirements and impose new requirements;
- They combine Rule 44, which applies to loading, and Rule 46, which applies to lightering;
- They make minor corrections and clarifications.

A section-by-section explanation of changes made is included in the Appendix to this staff report.

A. Proposed Control of Currently Unregulated Liquids (§§ 222, 301)

The Air District is proposing to extend control requirements to all cargoes with a flash point less than 100 ˚F. This threshold is proposed for four reasons: (1) data shows that there is significant Bay Area traffic in unregulated commodities with a flash point below 100 ˚F, (2) these cargoes can be readily identified prior to loading, (3) liquids with a flash point below 100 ˚F are extremely volatile and therefore produce significant emissions, and (4) control of emissions from

the currently-regulated liquids, each of which has a flash point below ˚F, has proven to be both feasible and cost effective.

The flash point of a material is the lowest temperature at which a liquid will generate sufficient vapor to form a flammable air-vapor mixture near its surface. Flash point is inversely related to volatility and vapor pressure because a flammable material with a greater tendency to volatilize will support ignition at a lower temperature than a flammable material that is less volatile. Thus, flash point may be used as a surrogate for vapor pressure. Although the Air District has considered using a vapor pressure criterion as the trigger for control requirements, the regulated community overwhelmingly prefers the use of flash point because this data is usually known for each cargo while vapor pressure is not. Further, the procedure to measure flash point is much simpler than that required to measure vapor pressure.

Materials with a flash point of below 100 degrees:

• all 5 materials currently subject to control requirements in Rules 44 and 46 (crude oil has a large flash point range and some crude oils may have a higher flash point than 100 ˚F, however, the 5 currently regulated materials, including all crude oils, will continue to be subject to control requirements regardless of their flash point.

• all BTEX compounds (benzene, toluene, xylene)
• most alcohols, except for those with the lowest vapor pressures (and therefore the lowest expected loading emissions)

Importantly, a flash point criterion of less than 100 degrees would **exclude** the following materials from control requirements, since each of these has a flash point of 120 degrees or more:

• diesel fuel
• all distillate fuel oils
• all residual fuel oils

Therefore, a flash point criterion of 100 ˚F will require emission controls for most materials in the category of "organic chemicals" in Table 6 in Section II.A – materials that are expected to have loading emissions as high as those of the 5 currently-regulated materials, but will not require controls for materials (diesel fuel, distillate and residual fuel oils) that have not been established to have emission factors that exceed the current control standards of Rules 44 and 46 (2 lb/thousand bbl of material loaded).

The primary effect of the proposed amendments would be to extend control requirements to a group of volatile organic chemicals that are not listed in the current rule and are handled in relatively small quantities in the Bay Area. These cargoes are as volatile as the cargoes currently controlled and therefore produce relatively high emissions during loading or transfer. Although some loading of these chemicals is already regulated if the chemicals are to be used as gasoline blending stock, other loading of the same chemicals escapes control simply because the individual chemicals are not listed in the rule. While it was true in 1989 and is true today that controls on the five specified cargo categories capture the overwhelming majority of emissions

from these activities, additional emission reductions would be achieved by regulating the loading of these additional volatile organic chemicals. These emissions reductions would be cost effective because the high volatility of the cargoes means that significant emission reductions can be achieved by controlling a relatively small volume of cargoes.

The proposed amendments would retain the current list of cargoes for which controls are required and supplement the list by specifying that any cargo with a flash point below 100 ˚F would also have to be controlled. This "hybrid" approach has numerous advantages. By retaining the current approach of listing by name most of the cargoes to be controlled, the rule would continue to provide for certainty and clarity. Using flash point also provides a clear means to identify other cargoes subject to control as it is a known value for most refined products, is relatively easily tested for, and is required to be known for compliance with various regulations that govern the transportation of flammable liquids. The certainty provided by the rule is crucial from the perspective of terminal and ship operators, who must plan for dock time and equipment availability, and useful for the Air District, which can readily identify activities subject to the rule.

During the rule development process, concern was expressed that failure to regulate distillate and residual oils would result in significant continuing workplace exposure to toxic air contaminants that could be significantly reduced by regulating these liquids. Workplace exposure to benzene and other hazardous air pollutants is regulated by the U.S. Occupational Safety and Health Administration (OSHA) and Cal/OSHA, and both agencies have established limits on workplace exposures to benzene. Under OSHA rules, employers must monitor worker exposures and limit those exposures.

By limiting emissions from loading activities, the current Air District rules have an additional beneficial effect in reducing the opportunities for workplace exposures. The volatile cargoes regulated by the current rule contain hazardous air pollutants (HAPs) such as benzene, toluene, and xylene. Other commodities loaded at marine terminals also contain these HAPs. U.S. EPA has developed the HAP emission factors for marine loading shown in Table 8.

TABLE 8: HAP EMISSION FACTORS – MARINE LOADING

HAP	HAP Emission Factors (lb/1000 bbl)		
	Gasoline	Crude Oil	Distillate Fuel
benzene	0.63 (tankers) 1.219 (barges)	0.269 (tankers) 0.420 (barges)	0.0016 (tankers) 0.0039 (barges)
toluene	1.092 (tankers) 2.016 (barges)	0.180 (tankers) 0.294 (barges)	0.0013 (tankers) 0.0033 (barges)
xylenes	0.336 (tankers) 0.630 (barges)	0.040 (tankers) 0.067 (barges)	0.0032 (tankers) 0.0008 (barges)

As a check on the EPA emission factors for HAPs, the Air District compared EPA's benzene

emission factor to results from Air District source test results for uncontrolled loading of distillate oil into a barge. The benzene emission factor for the test was 0.0063 lb/1000 bbl, which is relatively close to the EPA factor of 0.0039 lb/1000 bbl.

To assess the relative risks posed by the currently unregulated cargoes, HAP emission factors for those cargoes can be compared to post-control factors for the high-volatility cargoes regulated under the current rules. Because the current rules require emissions to be reduced to 2lb/1000 bbl or by 95%, the emission factors for high-volatility cargoes would have to be reduced by 95% for purposes of this comparison. A comparison between controlled emissions for loading gasoline and uncontrolled emissions for loading distillate fuel is shown in Table 9.

TABLE 9: HAP EMISSIONS – GASOLINE AND DISTILLATE FUEL

HAP	**HAP Emission Factors, Barge Loading (lb/1000 bbl)**	
	Gasoline, Controlled	Distillate Fuel, Uncontrolled
benzene	0.061	0.0039
toluene	0.101	0.0033
xylenes	0.032	0.0008

From the comparison above, it can be seen that post-control emissions of HAPs from loading gasoline are 15 to 40 times greater than uncontrolled emissions from distillate oil. This comparison demonstrates that risks from currently unregulated cargoes are sufficiently low that requiring controls would have minimal benefits to workers. This result is not surprising given the great difference in volatility between the two fuels. Through the existing requirements, the Air District has already achieved most of the reduction in worker exposure to HAPs that can be achieved through controls on marine tank vessel loading.

Another comment received during the rule development process was that Regulation 8, Rule 44 should be structured like South Coast AQMD Rule 1142. The comment was based on an assumption that the South Coast AQMD rule is more stringent than the BAAQMD rule and requires controls for a broader range of cargoes. This assumption is incorrect. Rather than specifically naming the cargoes to be controlled or using an easily-determined trigger like flash point, the South Coast rule states that no loading event may be conducted unless emissions are limited to 2 lb/1000 bbl or reduced by 95%. However, to determine whether emissions exceed the limits requires testing that "shall be conducted for at least 30 minutes during the transfer of the last 50 percent of total liquid cargo." As a result, it cannot be known in advance whether controls are required for a particular cargo. In practice, the South Coast AQMD enforces controls on essentially the same cargoes controlled under the BAAQMD rule. This picture is complicated by an EPA consent decree that requires one South Coast terminal to control all cargoes until EPA approves a "protocol" that will "function as a preliminary determination for whether loading and housekeeping events are subject to Rule 1142," i.e., a means of providing the certainty that Rule 1142 lacks. Current Regulation 8, Rule 44 provides for certainty

regarding the cargoes to be controlled, and the proposed amendments are intended to preserve that approach.

B. Proposed Requirements for Ballasting (§§ 203, 302)

Current Regulation 8, Rule 44 was intended to require controls for ballasting. However, the rule accomplishes this indirectly by defining, the term "loading of organic liquid" to include "the loading into a tank vessel where the prior cargo was an organic liquid." This definition (in current § 211) is proposed for deletion. The proposed amendments would add a definition of ballasting (proposed § 203) and provisions restricting ballasting into cargo tanks that contained a cargo of an unregulated organic liquid (proposed § 302).

Emissions from ballasting are declining because few vessels calling on the Bay Area ballast into cargo tanks. Modern vessels have segregated ballast tanks that are used only for ballast water. Older vessels are being phased out of service in response to the Oil Pollution Act of 1990 (OPA 90). The tanker fleet that serves the Bay Area is relatively modern, and ballasting emissions are expected to decline to insignificance in the future.

The proposed amendments require that ballasting emissions be controlled or that emissions be limited through the use of segregated ballast tanks, dedicated clean ballast tanks, or through containing or transferring vapors within a vessel. Under current U.S. Coast Guard regulations, vessels without segregated ballast are required to have a means to contain ballasting emissions and to employ those means when ballasting within ozone non-attainment areas.

To the extent that ballasting that would violate proposed Section 8-44-302 is required for vessel safety, a vessel can rely on the safety exemption of proposed Section 8-44-115 (current § 402).

C. Proposed Control of Gas Venting Operations (§§ 225, 303)

Air District rules do not directly address emissions from tank washing, purging, and gas freeing. In a March 2005 compliance advisory, the Air District interpreted the rules to apply to these activities when the activities are associated with a regulated loading or lightering activity. The Air District is now proposing to require controls for all “venting” activities that involve release of vapors from regulated cargoes and to require record keeping for all such activities.

Tank inerting, cleaning, purging, and gas freeing carried out by marine tank vessel operators may result in the venting of tank vapors. All tankers that serve the Bay Area have inert gas generators that are used to introduce inert gas, typically scrubbed exhaust from an engine, into tanks. This inert gas ensures that tank atmospheres remain outside the explosive range. During inerting, the inert gas introduced into a tank may displace hydrocarbon vapors, which are vented through tank vents. Venting may also occur when the inert gas generator is run during cargo discharge to replace offloaded cargo .

Venting may also occur during various activities related to tank cleaning. Although most of the marine tank vessels that serve the Bay Area are in dedicated service and carry one narrow range of cargoes, tank cleaning may be required when a vessel loads a cargo different from those it typically carries. Tank washing is frequently done with machines – often called "Butterworths" after one brand name – and inerting and associated venting may occur during this process. If tank entry is required for final cleaning or to perform repairs, a vessel's inert gas system may be used to purge all hydrocarbon vapor from the tank. Gas freeing, which is the introduction of fresh air to replace inert or other gas for tank entry, may also result in venting of hydrocarbons.

The Air District estimates that approximately 2 to 4 venting events per month of crude oil tankers occurred in San Francisco Bay prior to issuance in March 2005 of a compliance advisory stating that most venting violated Regulation 8, Rules 44 or 46. Several ship operators have indicated that they have discontinued the practice of uncontrolled venting within San Francisco Bay and that venting emissions are either controlled, or venting is performed outside of Air District waters.

Air District staff originally proposed control requirements on all venting occurring not only within the District, but also out to the boundary of "California Coastal Waters." The definition of California Coastal Waters included in the proposal was developed by the California Air Resources Board (CARB) in the late 1970's. The defined area was intended to encompass those areas off the California coast within which emissions released by vessel activities would be likely to travel to shore and affect air quality over land. The definition was based on meteorological research and tracer studies that involved the release of tracer gases by vessels offshore and their detection by sensors placed along the coast. The venting prohibition out to the limit of California Coastal Waters that was included in the earlier proposal was based on a similar prohibition in the South Coast AQMD rule.

The proposed amendments would impose venting controls only out to the limit of California's territorial waters, 3 miles off the coast, rather than to the limit of California Coastal Waters. The current proposal is simply a reflection of practical considerations: the Air District has not found a means of documenting and enforcing such a prohibition at sea. Within the Bay and in nearshore waters, the Air District can, with the assistance of the Coast Guard, maintain these restrictions. In a March 2005 compliance advisory, the Air District interpreted the existing marine tank vessel rules as prohibiting venting within the District, and the Coast Guard assisted the District by notifying mariners of the prohibition. Though the South Coast rule includes the broader prohibition, Air District staff believe such a prohibition to be impractical for the Bay Area at present.

The proposed amendments include a requirement for operators of marine tank vessels that call on the Bay Area to maintain records of tank cleaning activities that occur, not only within the District, but also anywhere in California Coastal Waters. There are two reasons for this proposal. First, the records would allow the Air District to properly enforce the rule. Under the existing and proposed rules, controls are required when an unregulated liquid is loaded into a tank that held a prior cargo of a regulated liquid., except when the tank was cleaned after discharge of the prior cargo. Tank cleaning records would allow the Air District to verify that loads exempted from controls on this basis are appropriately exempted.

Second, the records would help the Air District determine whether tank cleaning should be further regulated. Venting during tank cleaning can involve significant emissions. Tank cleaning tends to volatilize cargo residues, adding to existing tank vapor from the prior cargo. These tank vapors are then frequently vented to the atmosphere during purging and gas freeing operations associated with tank cleaning. This purging and gas freeing can produce many tons of emissions over a relatively short period of time. Typically, tank cleaning is related to a change in the type of cargo being carried in a tank (called "switch loading") and is dictated by incompatibilities between the prior cargo and the cargo to be loaded. However, in this situation – where tank cleaning may be necessary and appropriate – potentially enormous emissions are released, and shippers may avoid the full environmental costs of this type of transaction by conducting the activity offshore. It is likely that, in many cases, emissions from this type of activity can be controlled at terminals by using organic liquid washes and then conducting loading using the terminal's vapor recovery system.

The tank cleaning records would give the Air District a verifiable means to determine the frequency of this activity and would allow more accurate estimates of emissions. When a vessel engages in tank cleaning, an entry is required in the Oil Record Book required by federal law and international regulations. The records required under the proposal could therefore be checked against Oil Record Book entries for verification.

If, after reviewing tank cleaning records in the future, the Air District determines that further restrictions on tank cleaning are appropriate, it has full legal authority to regulate these activities out to the limits of California Coastal Waters. During the rule development process, refining industry representatives stated that they did not believe the Air District had this authority. The industry representatives based this claim on the U.S. Supreme Court's decision in a case called *United States. v. Locke,* 529 U.S. 89 (2000). But nothing in the *Locke* decision alters the Air District's view that it has the authority to regulate air emissions from marine tank vessel activities. In *Locke*, the Supreme Court reaffirmed the approach it took in an earlier case, *Ray v. ARCO*, 435 U.S. 151 (1978), in which it held that a state agency's regulatory jurisdiction is preempted only where Congress has intended a federal statute to "occupy the field" and preempt state authority in the "field", or (2) where Congress intended to allow concurrent regulation by federal and state regulation, but the state regulation conflicts with federal regulation.

Refinery representatives have claimed that the federal Ports and Waterways Safety Act (PWSA) would preempt Air District regulation of venting out to the limits of California Coastal Waters because such regulation would conflict with the PWSA. However, the PWSA is intended to protect against shipping accidents and resulting oil spills. It does not address air emissions in any way. Nothing in the current Air District rule would conflict with safety requirements under the PWSA. Even if such a theoretical conflict could be found, the Air District rule specifically exempts "acts necessary to secure the safety of a vessel or for saving life at sea." For these reasons, the Air District believes the proposed rule presents no conflict with federal law and that future regulation of tank cleaning, properly structured, would present no such conflict.

D. Proposed More Stringent Leak Standard (§ 305)

As discussed in Section II.B, the current "gas tight" standard for marine tanks and connectors subject to control requirements (10,000 ppm) appears to be less stringent than the standard in the South Coast AQMD and the San Luis Obispo County APCD (1,000 ppm). As noted, however, the Air District imposes a more stringent 100 ppm standard, found in Regulation 8, Rule 18, at all of the marine terminals regulated by Regulation 8, Rule 44.

The Air District is proposing amendments that clarify applicability of the Regulation 8, Rule 18 standards to marine terminals and impose a default 1,000 ppm standard for terminals not subject to this rule. The amendments retain the 10,000 standard for equipment on ships. Marine tank vessel operators have indicated that connectors and other fugitive sources in service on ships cannot meet the same low level of leakage achieved in shore service because of the harshness of the marine environment and because ship structures are subject to changing mechanical forces (determined by sea conditions, cargo volumes and cargo distribution) that make tight sealing of components more difficult than for non-marine components.

The proposed amendments require efforts to minimize leaks on shipboard equipment during loading and remove the requirement to halt loading when leaks are discovered. This amendment is intended to reduce overall emissions. Halting a loading operation when a leak is discovered has great potential to increase emissions as it forces the vessel to remain longer at the terminal increasing the potential for venting, requires longer waits for other vessels arriving to load, and requires breaking and restoring connections with the potential for creating additional leaks.

The proposed amendments also include an explicit requirement for operators to inspect equipment for leaks by "sniffing" components such as hose fittings and hatches with a handheld detector. The current rule does not include an inspection mandate, but most terminals already conduct such inspections.

E. Proposed Notification Requirements (§§ 403, 404)

Current section 8-44-402 states that nothing in the rule is to be construed to interfere with U.S. Coast Guard requirements or interfere with acts necessary for vessel safety or acts necessary for saving life at sea. This provision is retained in the proposed amendments but is renumbered as Section 8-44-115 and moved to the exemptions section of the rule. The exemption is necessary to ensure that the Air District does not penalize or burden activities necessary for safety.

The proposed amendments would require that the Air District be notified when the operator of a marine tank vessel or terminal operator invokes the safety/emergency exemption. Notice is required within 48 hours after the use of the exemption so as not to interfere with acts that may be necessary for safety. At present, the Air District has no means of knowing whether compliance with the rule is being excused through use of the existing exemption. The Air District expects that the exemption will be used when a vessel must vent a cargo tank to reduce pressures or to take on ballast during storm conditions when segregated ballast is insufficient and

emissions cannot be controlled, or in other circumstances involving some risk to a vessel or its crew.

The proposed amendments also include notification for lightering, ballasting, and tank cleaning activities that the Air District may wish to inspect. The specific activities for which notification would be required are not expected to be conducted frequently. Very little lightering activity is carried on presently. Most ships now ballast into segregated ballast tanks rather than cargo tanks, and notification would only be required for ballasting into cargo tanks. Because the proposed amendments would prohibit venting within District waters, with some exceptions, and because tank cleaning generally involves venting, tank cleaning notifications are also not expected to be common.

F. Proposed Record Keeping Requirements (§§ 501, 502, and 503)

The current rule includes record keeping requirements in Section 8-44-501. These requirements are clarified in the proposed amendments. The amendments propose separate recordkeeping requirements for terminal and vessels in order to clarify responsibilities. For both terminals and vessels, the records required by the proposed amendments are somewhat more detailed than those required under the current rule. The additional detail required includes information necessary to enforce the proposed requirements to control low flash point liquids as well as documentation of leak checks.

The proposed amendments also include requirements to keep records regarding the use of rule exemptions. These records are intended to allow the Air District to verify that exemptions are properly claimed.

G. Proposed Consolidation of Rules 44 and 46

Currently, Regulation 8, Rule 44 applies to loading of marine vessels at terminals while Rule 46 applies the same standards to vessel-to-vessel loading. These rules were adopted separately in 1989 because resource limitations did not allow rulemaking for both aspects of marine loading to be completed at the same time. However, consolidation of these largely identical rules at this time will simplify Air District regulations. The draft amendments would eliminate Rule 46 and consolidate all marine loading requirements in Rule 44.

H. Minor Amendment to Source Test Procedure

The amendments to ST-34 make corrections to temperature and pressure standardization errors in some equations and incorporate a requirement to determine gas constituent average concentrations on a flow-weighted basis in some circumstances.

I. Other Amendments

In addition, the proposed amendments contain minor editorial and administrative changes. All changes are shown in the Appendix to this staff report.

IV. Emission Reductions

A. Introduction

Emissions from marine tank vessel activities are discussed in Section II. This section discusses the emissions reductions anticipated from the proposed regulatory amendments.

B. Emission Reductions from Proposed Amendments

1. Proposed Control of Currently Unregulated Liquids

As discussed in Section III.A, the Air District is proposing to extend control requirements to all cargoes with a flash point of 100 ˚F or less. This amendment would affect the cargoes identified as "organic chemicals" in Table 1 in Section II.A. This category includes volatile organic chemicals such as benzene and toluene with high unabated loading emission factors similar to those for currently-regulated materials. These materials are not currently regulated by Regulation 8, Rule 44 unless they are used as gasoline blending stocks. The volume of these materials shipped through the Golden Gate in 2003 was 8,500,000 barrels. Assuming a very conservative (low) average factor of 10 lb/1,000 bbl, the emissions subject to control would be:

(8,500,000 bbl/yr) (10 lb/1,000 bbl) (ton/2,000 lb) = 42.5 ton/yr or 0.12 ton/day

Emission reductions from controlling these cargoes would be:

(8,500,000 bbl/yr) ((10 – 2) lb / 1,000 bbl) (ton/2,000 lb) = 34 ton/yr or 0.09 ton/day

A significant portion of these emissions consists of compounds, including benzene and toluene, which are categorized as toxic air contaminants. To the extent that some cargoes included in this category may already be subject to control requirements if they are used as gasoline blending stocks, the emission reduction would be lower.

2. Proposed Amendments to Leak Standard

The proposed amendments will make it clear that the Air District's Regulation 8, Rule 18 standards apply to marine terminals subject to that rule. The proposed amendments also establish a 1000 ppm standard for any terminal that is not subject to Regulation 8, Rule 18.

Because the Air District is already enforcing the 100 ppm standard in Regulation 8, Rule 18 at most or all of the marine terminals subject to Regulation 8, Rule 44, no reduction in emissions is expected at marine terminals. Because the Air District is not changing the current standard for shipboard equipment, no emission reductions are expected from vessels.

3. Proposed Control of Gas Venting Operations

The TAD for Further Study Measure FS-11 found evidence that crude oil tankers performed approximately 2 to 4 venting events per month (total) in San Francisco Bay, and estimated that the resulting emissions could be as high as 720 tons per year if a typical venting event resulted in

15 tons of emissions. Crude oil tankers are the most likely vessels to undergo venting because they occasionally take on a different cargo after unloading crude, which may require that the cargo tanks be cleaned and vented.

Using the AP-42 emission factor for crude tanker ballasting, 46 lb/1000 barrels, emissions from fully venting a typical 120,000 dead weight ton (dwt) crude oil tanker with a capacity of 750,000 barrels would be 17 tons. Even if only one such tanker were vented per month, emissions could be as high as 200 ton/yr. Requiring controls for these activities would reduce emissions by approximately 190 ton/yr or 0.52 ton/day. If ship operators elect to perform venting outside of Air District waters, as appears to be the case since 2004, rather than controlling emissions within San Francisco Bay, then an emission reduction would still occur within the District.

V. Economic Impacts

A. Cost Effectiveness

The primary costs associated with the proposed amendments to Rule 44 are for control of additional cargos with a flash point below 100 ˚F.

As noted in Section IV.B.2, new equipment or improved maintenance practices are not expected to be necessary to comply with the new proposed "gas tight" standard since this standard is already in effect at other port areas in California.

As noted in Section IV.B.3, the practice of venting organic gases from ships within San Francisco Bay without emission controls appears to have been discontinued by ship operators. It is expected that ship operators will continue to perform most venting outside of Air District waters rather than control these emissions as required by the proposed amendments. Therefore, no cost is associated with the proposed requirement to control venting emissions from vessels previously loaded with regulated materials.

Although there may be increased costs associated with the proposed new monitoring and recordkeeping requirements for both regulated and unregulated organic liquids, most of this monitoring and records are already required by Coast Guard regulations and other regulations, so the overall cost increase is expected to be minimal. With regard to data-gathering for unregulated materials, the Air District will allow ship operators to develop monitoring plans that will obtain the required data in the most efficient manner and will allow operators to petition for exemptions from monitoring requirements where specific vessel conditions would entail extraordinary cost or difficulty or when sufficient data has been obtained for specific materials.

1. Costs for Expanded Control Requirements

As noted in Section III.A, the expanded control requirements for loading of cargos with flash points lower than 100 ˚F are expected to affect, at most, 8,500,000 bbl/yr of additional cargo with approximately 34 ton/yr of organic emissions. To the extent that some of these cargos are used as gasoline blending stocks they are already subject to control.

Because the new materials subject to control will represent only about 4% of the materials already subject to control, it is expected that existing abatement facilities will be able to accommodate these additional materials without significant capital costs. These materials may be assumed to be loaded into barges rather than large tankers.

The Air District analyzed costs for controlling low-flash-point cargoes by estimating the various utility and labor costs that would be incurred in controlling these additional cargoes. This analysis assumes no new capital investment given the minor incremental increase in cargo volume. The vapor control systems that are used to control loading emissions burn natural gas and consume electricity. In addition, labor costs would be incurred for the additional time that the systems would have to run. The Air District's analysis of these costs is shown in Table 10 on the following page.

Table 10
Cost and Cost Effectiveness
Expand Control Standard (Oxidizer) to Materials with Flash Point Less Than 100 °F

I. Abatement Costs

Additional controlled material (thou bbl/yr)[1]	Oxidizer Natural Gas Usage (thou scf/yr)[2]	Natural Gas Cost ($/yr)[3]	Oxidizer Electrical Usage (kW-hr/yr)[4]	Electrical Cost ($/yr)[5]	Oxidizer Operating Hours (hr/yr)[6]	Operational Labor Cost ($/yr)[7]	Maintenance Labor Cost ($/yr)[8]	Total Cost ($/yr)
8,500	15,749	113,392	79,231	8,297	1,743	261,375	65,344	**448,407**

Notes:
1) From Table 5
2) Natural gas usage assumed to be 30% of loaded liquid volume (displaced gas volume) +10%
3) $7.2/1,000 scf from U.S. DOE natural gas price summary for industrial customers (July 05)
4) Assume 100 hp load, with operating time based on 8,000 bbl/hr loading rate
5) $0.10472/kWh average total rate for primary firm power for industrial customers from PG&E10/1/05 rate schedule
6) Assume 50,000 bbl/load, 8,000 bbl/hr loading rate, 2 hours before and after each load for startup/shutdown
7) Assume $75/hr/person for 2 persons
8) Assume 1/4 of operational labor cost

II. Cost Effectiveness

Additional controlled material (thou bbl/yr)[1]	Abatement Cost ($)[2]	Emission Reduction (ton)[2]	Cost Effectiveness ($/ton)
8,500	448,407	162	**2,777**

Notes:
1) From Table 5
2) Assume 95% emission reduction to 2/lb/1000 bbl of loaded material

B. Socio-Economic Impacts

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations". Applied Economic Development of Berkeley, California has prepared a socioeconomic analysis. The analysis concludes that the affected refineries should be able to absorb the costs of compliance with the proposed rule without significant economic dislocation or loss of jobs.

C. Incremental Costs

Under Health and Safety Code § 40920.6, the Air District is required to perform an incremental cost analysis for any proposed best available retrofit control technology rule. The Air District must: (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option."

In developing the proposed amendments, the Air District analyzed a control option that would expand control requirements to distillate and residual oils. As discussed in Section II.B.3 above, emissions from loading these cargoes during the one-year period from September 2000 through August 2001 are estimated to have been 0.07 tons per day for distillate cargoes and 0.14 tons per day for residual cargoes. The Army Corps of Engineers 2003 waterborne commerce data, discussed in Section II.B.1 above, shows lower volumes of these cargoes for 2003. Based on this data, 2003 emissions from these cargoes are estimated to have been 0.05 tons per day for distillate cargoes and 0.03 tons per day for residual cargoes.

The Air District used both the District's 2001 data and the Army Corps of Engineers 2003 data to calculate the incremental costs for controlling distillate and residual oils. The results of this incremental cost analysis are shown in Table 11. The cost for controlling these cargoes, regardless whether the calculations are based on the 2001 data or the 2003 data, is approximately $55,000 per ton, or 20 times the cost of controlling the organic chemical cargoes. These higher costs are the direct result of the need to control a much larger volume of cargo to achieve much smaller emission reductions.

The costs shown in Table 11 do not include the costs of new equipment. New equipment would almost certainly be required to control these cargoes. The Air District's data show that the volume of light cargoes loaded in 2001 was about 25 million barrels per year, while the volume of distillate and residual oils together was approximately 75 million barrels. If current loading volumes are even remotely similar to the 2001 volumes, the existing equipment would be required to control a cargo volume several times greater than current volume. In 2002, during development of the technical assessment document for marine loading, representatives of Bay Area refineries estimated that the capital costs to install new equipment to control

Table 11
Cost and Cost Effectiveness (Excluding Capital Costs)
Expand Control Standard (Oxidizer) to Distillate and Residual Oils

I. Abatement Costs

Material	Additional controlled material (thou bbl/yr)[1]	Oxidizer Natural Gas Usage (thou scf/yr)[2]	Natural Gas Cost ($/yr)[3]	Oxidizer Electrical Usage (kW-hr/yr)[4]	Electrical Cost ($/yr)[5]	Oxidizer Operating Hours (hr/yr)[6]	Operational Labor Cost ($/yr)[7]	Maintenance Labor Cost ($/yr)[8]	Total Cost ($/yr)
2001 Distillate Oils	25,812	47,825	344,337	240,600	25,196	5291	793,719	198,430	**1,361,681**
2001 Residual Oils	51,174	94,815	682,671	477,006	49,952	10,491	1,573,601	393,400	**2,699,624**
2003 Distillate Oils	17,000	31,498	226,783	158,461	16,594	3,485	522,750	130,688	**896,815**
2003 Residual Oils	11,600	21,493	154,746	108,127	11,323	2378	356,700	89,175	**611,944**

Notes:
1) From Tables 5 and 7
2) Natural gas usage assumed to be 30% of loaded liquid volume (displaced gas volume) +10%
3) $7.2/1,000 scf from U.S. DOE natural gas price summary for industrial customers (July 05)
4) Assume 100 hp load, with operating time based on 8,000 bbl/hr loading rate
5) $0.10472/kWh average total rate for primary firm power for industrial customers from PG&E10/1/05 rate schedule
6) Assume 50,000 bbl/load, 8,000 bbl/hr loading rate, 2 hours before and after each load for startup/shutdown
7) Assume $75/hr/person for 2 persons
8) Assume 1/4 of operational labor cost

II. Cost Effectiveness

Material	Additional controlled material (thou bbl/yr)[1]	Abatement Cost ($)[2]	Emission Reduction (ton)[2]	Cost Effectiveness ($/ton)
2001 Distillate Oils	25,812	1,361,681	24.5	**55,579**
2001 Residual Oils	51,174	2,699,624	48.6	**55,548**
2003 Distillate Oils	17,000	896,815	16.1	**55,703**
2001 Residual Oils	11,600	611,944	11.0	**55,631**

Notes:
1) From Tables 5 and 7
2) Assume 95% emission reduction

distillate and residual oils would be between $10 million and $25 million for all five refineries taken together. This capital cost estimate is in line with Air District's estimates of the costs for installing controls in response to the adoption of the original rule. This estimate does not include capital costs for independent terminals. It is therefore likely that the costs to control distillate and residual oils would be significantly higher than $55,000 per ton.

VI. Environmental Impacts

Pursuant to the California Environmental Quality Act, the Air District has had an initial study for the proposed amendments prepared by Environmental Audit, Inc. The initial study concludes that there are no potential significant adverse environmental impacts associated with the proposed amendments. A Negative Declaration is proposed for adoption by the Board.

VII. Regulatory Impacts

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in district rules. The district must then note any differences between these existing requirements and the requirements imposed by the proposed change.

Rules 44 and 46 are the only Air District rules that impose control requirements on marine vessel loading or lightering. A number of the marine terminals in the Air District are subject to the federal marine loading rule in 40 C.F.R. Part 63, Subpart Y. Table 12 on the following pages compares the federal and BAAQMD requirements.

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Source Size Thresholds			
Apply to sources with throughput of 10 million barrels of gasoline or 200 million barrels of crude oil calculated on an annual average basis for the period from September 19, 1996 to September 19, 1998 and on an annual basis thereafter. (§§ 63.560(b); 63.561 [def. of "Source(s) with throughput of 10M barrels or 200M barrels"].) A combined RACT and MACT standard applies to the Valdez Marine Terminal. (§ 63.562(d).)	Apply to existing major sources with loading emissions of 10 tons of a single HAP or 25 tons of a combination of HAPs calculated on an annual average basis for the period from September 19, 1997 to September 19, 1999 and on an annual basis thereafter. (§§ 63.560(a); 63.561 [def. of "Source(s) with emissions of 10 or 25 tons"].) Apply to new major sources with any HAP emissions from loading as calculated on an annual average basis for the period from September 19, 1997 to September 19, 1999 and on an annual basis thereafter. (§ 63.560(a), (d); § 63.561 [def. of "Source(s) with emissions less than 10 or 25 tons"].) A combined RACT and MACT standard applies to the Valdez Marine Terminal. (§ 63.562(d).)	Apply to all loading events involving 1000 barrels or more of gasoline, gasoline blending stock, aviation gas, JP-4, or crude oil. (Current §§ 8-44-110, 204.) Apply to loading events involving the loading of 1000 barrels or more of any commodity, including water (ballasting), into tanks which formerly contained one of the five commodities listed above. (Current § 8-44-211.)	No change in source size thresholds, but broader range of commodities affected. (Proposed §§ 8-44-110, 222.)

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Commodities Affected			
Commodities with true vapor pressure of 1.5 psia or greater. (§ 63.560(d)(1).)	Commodities with true vapor pressure of 1.5 psia or greater. (§ 63.560(d)(1).)	Gasoline, gasoline blending stock, aviation gas, JP-4, or crude oil. (Current § 8-44-204.) And Loading of any commodity into a tank where the prior cargo was one of the 5 listed commodities. (Current § 8-44-211.)	Same as current requirements, but with the addition of all commodities with flash point less than 100 °F. (Proposed §§ 8-44-222, 301.)
Exemptions			
Do not apply to existing offshore (≥ 0.5 mi.) loading terminals. (§ 63.560(d)(6).) Do not apply to ballasting. (§ 63.560(d)(7).) Do not apply to bunkering. (See § 63.560 [Def. of "Marine tank vessel loading operation"].) Do not apply to lightering. (See § 63.560 [Def. of "Source(s)"].) For vapor balancing systems, % emission reduction requirements do not apply, but provisions regarding vapor collection, ship-to-shore compatibility, and vessel vapor tightness do apply. (§ 63.560(d)(2).)	Do not apply to sources collocated at refineries subject to and complying with the Refineries NESHAP (i.e. loading emissions may be bubbled with refinery emissions). (§ 63.560(d)(3).) Do not apply to benzene loading operations subject to and complying with the benzene NESHAP. (§ 63.560(d)(4).) Applicability to existing offshore terminals, ballasting, bunkering, lightering, and vapor balancing systems same as for RACT.	Do not apply to bunkering. (Current § 8-44-111.) Do not apply to lightering. (Current § 8-44-112.)	Same as current for bunkering, but proposed rule would apply to lightering. (Proposed § 8-44-301.)

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Effective September 19, 1998 or upon start-up, if start-up occurs after 9/19/98, or within three years after exceeding the applicability threshold, if exceeded after 9/19/98, reduce captured VOC from loading of commodities with true vapor pressure of 1.5 psia or more by 98% with combustion, or by 95% with recovery, or to 1000 ppmv outlet concentration. (§§ 63.560(d)(1), (63.560(e)(2); 63.562(c)(3).) For the Valdez Marine Terminal, effective March 19, 1997, a combined RACT and MACT standard requires reduction of captured HAP and VOC emissions by 98% for at least two berths and for other berths if throughputs exceed certain specified levels. (§§ 63.560(e)(3); 63.562(d).) After 2002, no loading may be performed without controls, except as allowed under maintenance provisions of the rule. (§63.562(d)(2)(ii).)	Effective September 19, 1999 or upon start-up, if start-up occurs after 9/19/99, or within three years after exceeding the applicability threshold, if exceeded after 9/19/99, reduce captured HAP emission from loading of commodities with true vapor pressure of 1.5 psia or more by 97% for existing sources, 98% for new sources, and 95% for new offshore loading terminals. (§§ 63.560(d)(1), 63.560(e)(1); 63.562(b)(2), (3), and (4).) For the Valdez Marine Terminal, see discussion in the RACT column.	Reduce emissions by 95% from uncontrolled conditions or limit emissions to 2 lbs per 1000 barrels loaded. (Current § 8-44-301.)	No change. (Proposed § 8-44-304.)

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Vapor Collection System			
Collection system must be designed to collect VOC vapors displaced during loading and to prevent collected vapors from passing to the atmosphere through another berth. (§ 63.562(c)(2).)	Collection system must be designed to collect HAP vapors displaced during loading and to prevent collected vapors from passing to the atmosphere through another berth. (§ 63.562(b)(1).)	Emission control equipment must be designed and operated to collect and process all organic compound emissions from loading events to which the emission standard applies. (Current § 8-44-302.)	No change. (Proposed § 8-44-304.)
Ship-to Shore Compatibility			
A terminal owner or operator may only load vessels equipped with vapor collection equipment that is compatible with the terminal's vapor collection system. (§ 63.562(c).)	A terminal owner or operator may only load vessels equipped with vapor collection equipment that is compatible with the terminal's vapor collection system. (§ 63.562(b).)	Though there is no parallel BAAQMD requirement, such a requirement is implicit in the terminal and vessel vapor tightness requirements of current sections 8-44-303 and 304.	No change.
Terminal Vapor Tightness			
Whenever there is visual, audible, olfactory, or other evidence of a leak, an operator must conduct an inspection to identify the leak, must monitor it within 5 days using EPA Method 21, and must begin repair within 15 days or prior to the arrival of the next vessel, whichever is later. The entire system must be inspected annually using Method 21. (§ 63.563(c).) A leak is defined as a reading of 10,000 ppmv or greater determined using Method 21. (§ 63.561 [def. of "Leak"].)	Same as RACT.	All equipment associated with loading shall be maintained to be leak free (<4 drops/min.) and gas tight (≤10,000 ppm @ 1 cm.). (§§ 8-44-208, 209, 303.) In addition, loading must be halted when a liquid leak or gas leak is discovered and may continue only after repair. (Current § 8-44-304.2.)	Leak standards would become more stringent. (Proposed § 8-44-305.)

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Vessel Vapor-Tightness			
Terminal owner or operator may only load vessels that are connected to the vapor collection system and are vapor-tight. (§ 63.562(c)(2)(iii).) The terminal owner or operator must ensure compliance with the vapor-tightness requirement by (1) requiring pressure test or leak test documentation from the vessel owner or operator, (2) requiring the vessel owner or operator to conduct a leak test during loading, or (3) loading under negative pressure. (§ 63.563(a)(4).) If a leak is discovered during loading (of a vessel lacking pressure test or leak test documentation), the vessel owner or operator must document the leak and repair it prior to the next loading operation, unless the repair would require cleaning and gas freeing or dry-docking. (§ 63.563((a)(4)(iii).) A terminal owner or operator may not load a vessel that has failed a leak test unless the leak was repaired or the repair would require cleaning and gas freeing or dry-docking. (§ 63.563(a)(4)(ii).). A leak is defined as a reading of 10,000 ppmv or greater determined using Method 21. (§ 63.561 [def. of "Leak"].)	Same as RACT.	All hatches, pressure relief valves, connections, gauging ports, and vents associated with loading are to be maintained to be leak free (<4 drops/min.) and gas tight (≤10,000 ppm @ 1 cm.). (§ 8-44-208, 209, 303.) The vessel owner or operator must certify that the vessel is leak free and gas tight. (§ 8-44-304.1.) In addition, loading must be halted when a liquid leak or gas leak is discovered and may continue only after repair. (§ 8-44-304.2.)	No change in leak standards but requirements for leak certification and to halt loading removed. Certification requirement dropped as no longer necessary to assign responsibility for leaks. Halt loading requirement dropped to minimize startup and shutdown emissions. New requirements to conduct inspections would apply. (Proposed § 8-44-305.)

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Carbon Adsorber Emissions			
A terminal owner or operator using a carbon adsorber to control emissions must prevent HAP emissions from the regeneration of the carbon bed. (§ 63.562 (c)(5).)	A terminal owner or operator using a carbon adsorber to control emissions must prevent HAP emissions from the regeneration of the carbon bed. (§ 63.562 (b)(5).)	Emission control system must be designed and operated to collect and process all organic compound emissions. (Current § 8-44-302.)	No change. (Proposed § 8-44-304.)
Exempt Loading Events			
Control requirements do not apply to loading at a berth during a maintenance allowance approved by the EPA Administrator. (§ 63.562(c)(6).)	Control requirements do not apply to loading at a berth during a maintenance allowance approved by the EPA Administrator. (§ 63.562(b)(6).)	Control requirements do not apply to loading events of less than 1000 bbls. (§ 8-44-110.)	No change.
Initial Compliance Demonstration			
Initial performance test required within 180 days after the compliance date for the affected source. (§ 63.563(b)(1).) During the initial performance test, the owner or operator must establish operating ranges for various control system parameters. (§ 63.563(b)(4) to (b)(9).) The owner or operator must perform a maintenance inspection when monitoring data shows operation outside acceptable ranges. (§ 63.563(b)(3).)	Same as RACT.	None.	No change.

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Monitoring Requirements			
An owner or operator must monitor specific parameters set forth in the federal regulation. (§ 63.564.)	Same as RACT.	No monitoring requirements analogous to the federal requirements. Monitoring requirements are established by permit conditions for the particular source and control equipment.	No change.
Test Methods			
For vessel vapor tightness, the methods specified in § 63.565(c). For control devices (except flares), the methods specified in § 63.565(d). For flares, the methods specified in § 63.565(e). For emissions estimates used to determine applicability, the method specified in § 63.565(l). For other parameters, see §§ 63.565(f) to (k).	Same as RACT.	For loading emissions, BAAQMD Manual of Procedures, Volume IV, ST-34. For mass emission rates, ST-4. For leaks, EPA Method 21.	For flash point determinations, two ASTM methods. Otherwise, no change in methods applicable.

TABLE 12: COMPARISON OF FEDERAL AND BAAQMD REQUIREMENTS

Federal RACT Requirements	Federal MACT Requirements	Current BAAQMD Requirements	Proposed BAAQMD Requirements
Record Keeping and Reporting Requirements			
An owner or operator must: • Notify EPA that it is subject to the rule • Notify regarding construction or reconstruction • Provide throughput and emissions data related to rule applicability • Submit excess emissions and system performance reports where a CMS is required • Submit initial performance reports • Maintain on site an engineering report describing the control system • Maintain records regarding all times when emissions bypass the control system • Maintain vapor-tightness documentation for all vessels loaded • (MACT only) Maintain records regarding exempt loadings, emission estimates, HAP control efficiency • Maintain leak inspection and repair records (§ 63.567.)	Same as RACT.	The owner or operator must keep operating records for each loading event. The records must specify, among other things, the vessel loaded, the date and time, the cargo loaded, the prior cargo, and the condition of the tanks prior to loading. (Current § 8-44-501.)	Additional record keeping requirements for all activities. (Proposed §§ 8-44-501, 502.) New record keeping requirements for use of safety/emergency exemption. (Proposed § 8-44-503.)

VIII. Rule Development Process

A. Workgroup Meetings

Air District staff formed a technical working group that consisted of representatives from Western States Petroleum Association, the refineries, independent terminal operators, ship operators, engineering consultants, Communities for a Better Environment, and CARB and Air District staff.

- On June 13, 2002 the workgroup met at the offices of Eichleay Engineers in Concord to discuss development of the technical assessment document, source testing, and the emissions inventory.
- On August 7, 2002, the workgroup met, again in Concord, to discuss housekeeping emissions, ballasting, and factors that influence costs to the ship operator.
- On November 11, 2002, the workgroup met to further discuss source testing and control options.
- On May 13, 2003, the workgroup met in the Air District offices to discuss concepts for control of additional cargos, lowering the emission standard of 2.0 lb/1000 bbl loaded, controls for ballasting and housekeeping operations, and reporting of marine cargo activity.
- On July 21, 2003, the workgroup met again at Air District offices to further discuss these regulatory concepts.
- Finally, on June 22, 2004 a meeting was held with shippers and agents at the Air District offices to discuss costs of controlling additional cargos, compliance experience with the Santa Barbara and South Coast rules, and cargo tank cleaning in San Francisco Bay.

B. Public Workshops

On August 8, 2002, staff held a public workshop at the Rodeo Senior Center to discuss possible changes to Regulation 8, Rules 44 and 46. Staff discussed basic regulatory concepts prior to preparing proposed amendments.

On October 16, 2003, staff held a workshop at the Crockett Community Center to discuss proposed amendments. Major issues discussed at the workshop were the desire expressed by the affected facilities for a clear method to determine in advance whether controls are required for a particular loading event, concerns of the affected facilities that the cost of controlling additional loads would be excessive, would require the use of large quantities of natural gas, and would generate significant amounts of secondary pollutants such as NOx to reduce a small amount of organic compound emissions.

On October 19, 2005, staff held a workshop at the Benicia City Council chambers to discuss proposed amendments. Major issues discussed at the workshop were the preference for use of flash point as a criteria for control requirements by loading operators, and whether the data available to the Air District for diesel, distillate, and residual fuel oils could be used to accurately estimate emissions from these materials.

IX. Conclusion

The proposed amendments to Regulation 8, Rule 44 and Rule 46 are expected to be cost effective and to reduce emissions of volatile organic compounds by approximately 0.61 tons per day. In addition, the amendments will also reduce emissions of toxic air contaminants. The proposal would achieve these reductions by focusing controls on a relatively small volume of volatile organic chemical cargoes that are not regulated under the current rule and by imposing restrictions on marine tank vessel venting.

The cargoes that would become regulated under the proposal are organic chemicals, such as benzene, toluene, and xylene, which have low flash points and evaporate readily at ambient temperatures. Significant emission reductions can be achieved by controlling a relatively small volume of cargoes, and the cost effectiveness for the controls is roughly $3000 per ton. Because the cargoes to be controlled are also toxic air contaminants, the proposed controls will also reduce worker exposure to toxic compounds.

Emissions would also be reduced by the proposed prohibition on venting of cargo tanks that contain or contained a regulated cargo. Though the Air District recently interpreted the existing rules to prohibit venting within the District, the proposed amendments would clarify and formalize the restrictions, and would ensure that emission reductions that may have occurred are permanent.

The proposed amendments preserve the current structure of the rule, which relies on identifying, in advance of loading. the cargoes for which controls are required. This certainty allow better planning and use of resources for both industry and the Air District and makes the rule easier to enforce.

Pursuant to Section 40727 of the California Health and Safety Code (H&SC), regulatory amendments must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference. The proposed amendments are:

- Necessary to achieve cost-effective emission reductions from marine tank vessel operations and to clarify control, notification, and record keeping requirements;
- Authorized by H&SC Sections 40000, 40001, 40702, 40725 through 40728, 40919, and 42300 *et seq*.;
- Written or displayed so that their meaning can be easily understood by the persons directly affected by them;
- Consistent with other Air District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules, or regulations.

The proposed amendments have met all legal noticing requirements and have been discussed with interested parties. District staff recommends adoption of the amendments as proposed.

X. References

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APPENDIX

Amended Title, Section 101

The title and rule description are amended to reflect that Rule 44 rule will apply not only to terminal operations, but also to ship-to-ship loading since Rule 46 will be incorporated into Rule 44. Also, the rule is expanded to include non-precursor organic compounds; this amendment is discussed in the description of the amendment to Section 215.

Amended Section 110

This exemption is re-titled to more precisely indicate the scope of the exemption. Also, editorial changes.

Amended Section 111

Editorial change.

Deleted Section 112

The lightering exemption is deleted because Rule 46 requirements for ship-to-ship loading will be incorporated into Rule 44.

Deleted Sections 113 and 114

These delayed compliance provisions are deleted because the effectiveness date (7/1/92) has passed.

New Section 115 / Deleted Section 402

The current exemption for safety considerations and emergency operations appears in administrative Section 8-44-402. However, exemptions are more appropriately included in Section 100. Therefore, the text of Section 402 is simply moved to this new exemption.

New Section 116

A new limited exemption is added to exempt equipment from the leak standards in this rule if they are also subject to the leak standards of Regulation 8, Rule 18. Rule 18 has more stringent leak limits than are proposed in Rule 44 as well as extensive monitoring and leak repair provisions.

Section 200

The definitions in this section are re-organized alphabetically and re-numbered as necessary.

New Section 201

A definition of “aviation gas” is added.

New Section 202

A definition of “background” is added to provide guidance regarding the measurement of gaseous leaks.

New Section 203

A definition of “ballasting” is added.

New Section 204

A definition of “California Coastal Waters” is added.

New Section 206

A definition of “District Waters” is added.

New Section 208

A definition of “gas freeing” is added.

New Section 209

A definition of “gasoline” is added.

New Section 210

A definition of “gasoline blending stocks” is added.

New Section 211, 212

New definitions of “inert gas” and “inerting” are added.

New Section 213

A definition of “JP-4 fuel” is added.

Amended Section 215

The definition of a loading event is amended to reflect that Rule 44 rule will apply not only to terminal operations, but also to ship-to-ship loading since Rule 46 will be incorporated into Rule 44.

Amended Section 216

The definition of tank vessel is changed to “marine tank vessel” for consistency and is simplified without substantive change.

Amended Section 219

The definition of "organic compound, precursor" is replaced with a definition of "organic compound" in order to expand the applicability of the rule to include non-precursor organic compounds as well as precursor organic compounds. Because there is no significant traffic in non-precursor organic compounds, this amendment is not expected to result in control of many additional loading events. However, because uncontrolled loading events tend to have very high emission levels, excluding non-precursor organic compounds from control requirements may result in substantial daily emissions. Sections 8-44-101, 219, 601 and 603 are also amended for consistency.

New Section 220

A definition of "prior cargo" is added.

New Section 221

A definition of "purging" is added.

Amended Section 222

The definition of organic liquid is amended in order to expand control requirements from the current 5 materials to all organic liquids with a flash point less than 100 degrees F.

The reference to "aviation fuel (JP-4 type)" is changed to JP-4 fuel. The effect of this change is to expand the control requirements from JP-4 used as a jet fuel to different formulations of JP-4 used as turbine fuels or other types of fuel. This expansion is justified because there is no significant difference in emissions from different formulations of JP-4. However, no emission reductions or costs are expected to result from this expansion because JP-4 fuel is believed to no longer be in use.

New Section 223

A definition of "tank cleaning" is added.

New Section 224

A definition of "unregulated organic liquid" is added that is consistent with new Section 222.

New Section 225

A definition of "vent" is added.

Deleted Section 208

A definition of "leak free" is no longer necessary because the definition has been incorporated into Section 8-44-303, so this section is deleted.

Deleted Section 209

A definition of "gas tight" is no longer necessary because the definition has been incorporated into Section 8-44-303, so this section is deleted.

Deleted Section 211

A definition of "loading of organic liquid" is no longer necessary for the amended rule, so this section is deleted.

Deleted Section 212

Because exemption 8-44-113 is deleted, the definition of infrequent visits is no longer required.

Deleted Section 213

Because exemption 8-44-114 is deleted, the definition of a small terminal is no longer required.

New Sections 301 and 302 / Deleted Sections 301 and 302

New Sections 301 and 302 are created which include the current control requirements from deleted Sections 301 and 302 for loading and lightering of regulated organic liquid and ballasting. This section formally extends the authority of the rule to "District Waters".

New Section 303

A new control requirement is added for venting operations.

Amended Section 304

This section is amended to delete the obsolete effectiveness, to delete Section 304.2 (which is replaced by the minimization and repair requirements of new Section 8-44-303.2.

New Section 305 / Deleted Section 303

The current leak standards from Section 303 are incorporated into new Section 305 which clarifies the boundary between vessel leaks and terminal leaks. Liquid leak standards and gaseous leak standards on vessels remain the same while gaseous leak standards for terminals are reduced from 10,000 to 1,000 ppm. As in the current rule, leaks discovered by the APCO are subject to enforcement action. However, leaks discovered by the operators are subject to minimization and repair requirements.

Deleted Section 305

This section is deleted because it no longer has any effect. This section prohibits uncontrolled loading of regulated organic liquid when an ozone excess is predicted. However, as of July 1,

1991, uncontrolled loading of regulated organic liquid is prohibited entirely. This was an interim requirement that had force from July 1, 1989 until July 1, 1991 when the standards of the rule were phased in.

Deleted Section 401

This section is deleted because the effectiveness dates have passed.

New Sections 501 and 502/ Deleted Section 501

The recordkeeping requirements in current Section 501 have been divided into new Section 501 for marine terminals and new Section 502 for marine vessels. Recordkeeping requirements have been significantly expanded to provide monitoring for all rule requirements, including new leak monitoring requirements.

New Section 503

This section is added to require records for each of the exemptions provided in the amended rule.

Amended Section 504

Editorial change.

Amended Section 601 / Deleted Section 602

Current Sections 601 and 602 are combined in amended Section 601. Because source test method ST-4 is no longer in effect, alternate test methods are provided.

Amended Section 603

This section is amended for consistency with other amendments described in this report. Also, a provision for an alternate test method for leak determinations is provided.

New Section 604

Laboratory methods are added to allow determination of flash point as required in the amended rule.